

REMARKS

Claims 77 to 106, 108 to 139 are pending in this application. Reconsideration and allowance are respectfully requested.

Rejections under 35 USC 112.

The Examiner has rejected a number of independent claims under 35 USC 112, first paragraph, stating the subject matter was not described in such a way to reasonably convey that the Applicants had possession of the invention. Applicants traverse as discussed below:

Claim 94:

Claim 94, reciting in pertinent part

“A combination of ... a substrate having a surface ... comprising a noble metal, and wherein said surface is contacting a composition comprising: periodic acid ... and an abrasive ..., said composition having a pH selected from a group consisting of a pH from about pH 1 to less than pH 2 and a pH from above pH 5 to about pH 10 wherein on polishing ... the selectivity of the composition for polishing the noble metal-containing material over polishing the dielectric material is at least 1:1.”

The Examiner states the pH limitations are new matter because the specification does not literally define these ranges for the broad composition, citing section [0011] of the specification. Section [0011] recites a pH of about 5 to 10 or about 1 to about 4. Given original dependent claim 8, reciting a pH range of about 5 to about 10, Applicants assume the Examiner's rejection is based on the range “about pH 1 to less than pH 2.” Applicants concede the language “about pH 1 to less than pH 2.” is not present in the specification, and Claim 94 has been amended to delete the offending language. This amendment also makes the rejection under 35 USC 112, second paragraph, moot.

Regarding amended claim 93

The Examiner effectively requires the pH range in claim 94 be amended to delete the lower pH range. Example O (at [0103]) recites a pH of 1.2 to 1.8 for polishing Pt and an appropriate polishing selectivity of greater than 1:1. For low pH examples used to polish platinum, only a pH of 1.2 to 1.8 in Example O exhibits the appropriate selectivity, and amended claim 93 is intended to be a picture claim reciting this example.

Claims 112 and dependent claim 118:

Previously submitted Claim 112 recited in pertinent part

“A combination of a composition in contact with a substrate surface having at least one feature thereon comprising a noble metal, comprising:

A) a composition consisting essentially of: 1) water; 2) periodic acid in an amount from about 0.05 to about 0.3 moles/kilogram; 3) a first alumina abrasive in an amount from about 0.2 to about 6 weight percent; 4) optionally, a pH-adjusting agent in an amount sufficient to cause the pH of the slurry to be between about 1 to about 4 or between about 5 to about 10; 5) optionally, a suspension agent; and 6) optionally, an electrolyte, wherein said composition is contacting

B) a substrate surface having at least one feature thereon comprising a noble metal.”

The Examiner states the optional electrolyte component is new matter because the component was never literally defined for use in the broad composition but is supported only for Example 0 in combination with Pt. Claims 112 and 118 have been amended to delete the component.

Amended claim 132:

Applicants note the electrolyte, particularly ammonium chloride, is present in Example O for use with Pt, and claim 132 was amended to recite ammonium chloride. The dependency of claim 132 was changed to allow the inclusion of this compound.

Claims 122-125 and 128:

These claims depend from claim 118 and recite individual suspension agents, in particular a material having a CAS number of CAS#1344-28-1 (Alumina-C); a hydrous sodium lithium magnesium silicate; ammonium polymethacrylate; colloidal silica; and succinic acid, respectively. The Examiner states the particular suspension agents are new matter because the specification does not literally define these particular suspension agents for the broad composition. Applicants respectfully traverse, as discussed specifically below.

Claim 122: Applicants respectfully traverse. Claim 122 recites use of Alumina-C in combination in a slurry comprising an alumina abrasive. Applicants note that the combination of “suspension agents” as a general class are supported for the broad composition (as in original claim 11 and in claim 112), as is wherein the suspension agent comprises another abrasive (as in original claim 12 and in claim 117). CAS#1344-28-1 (Alumina-C) recited in claim 122 is supported. The specification states at [0049] that “For example, some Ir polishing compositions comprise ... a second abrasive as a suspension agent. By way of example, in some Ir-polishing compositions the second abrasive may be Alumina-C.” The invention of a combination having a second abrasive which functions as a suspension agent is supported, but the Examiner contends that Alumina-C is disclosed only for a particular combination described in Example E. That is, The Examiner is limiting the invention to the examples provided, in clear contravention of the

statement in paragraph [0144] that it is not intended that the scope of the invention be limited to the specific embodiments described. The specification states in paragraph [0049] that Alumina – C “is used to keep the slurry in suspension for a suitable and preferably long period.” The specification discloses the invention to one of ordinary skill in the art, and one of ordinary skill in the art would realize that such a property of increased slurry stability would be useful for all of the polishing slurries. Additionally, combinations of alumina abrasives are generally disclosed in for example paragraphs [0010] and [0012]. Applicants respectfully traverse this rejection.

Claim 123: Applicants respectfully traverse. Claim 123 recites a hydrous sodium lithium magnesium silicate. Similar to above, this material in paragraph [0055] is described as a second abrasive useful as a suspension agent, and the use of a second abrasive for a suspension agent is clearly disclosed for the broad composition. The specification discloses the invention to one of ordinary skill in the art, and one of ordinary skill in the art would realize that such a suspension agent would be useful not only for polishing Ir as in example F, but for all of the polishing slurries.

Claim 124: Applicants respectfully traverse. Claim 124 recites an ammonium polymethacrylate. This material in paragraph [0058] is described as a surfactant useful as a suspension agent, and the use of a surfactant for a suspension agent is clearly disclosed for the broad composition (e.g., as in claim 126). This is the only surfactant specifically disclosed in the specification. The specification discloses the invention to one of ordinary skill in the art, and one of ordinary skill in the art would realize that a teaching that a surfactant is useful as a suspension agent, and the only example of a surfactant so used would not be limited to the specific example in which it was used.

Claim 125: Applicants respectfully traverse. Claim 125 recites colloidal silica used as a suspension agent in a slurry having an alumina abrasive. This colloidal silica in paragraph [0061] is described as having “advantageous properties in terms of particle size and contribution to composition suspension and stability” so as to be useful as a suspension agent. The invention of a combination having a second abrasive which functions as a suspension agent is supported. Combinations of alumina and silica are generally supported, as for example in paragraph [0010]. There is nothing which would suggest to one of ordinary skill in the art that the advantageous particle size properties of colloidal silica which promote slurry stability in the example where Ir was polished would not be useful in a slurry where another noble metal is polished, particularly

when the specification states generally that alumina and silica combinations are useful. The Examiner is limiting the invention to the examples provided, in clear contravention of the statement in paragraph [0144] that it is not intended that the scope of the invention be limited to the specific embodiments described.

Claim 128: Applicants respectfully traverse. Claim 128 recites succinic acid used as a suspension agent in a slurry having an alumina abrasive. The specification discloses use of organic acids as suspension agents for the broad compositions. Paragraph [0066] states this example contained “an organic acid as a suspension agent”, and “in one embodiment, the organic acid is succinic acid.” The specification goes on to say that in alternative embodiments other soluble organic acids can be used. The specification does not say, as the Examiner is reading it, that “if the composition is as described in example J and is used for polishing Ir, then succinic acid will be a useful suspension agent.” One of ordinary skill in the art would realize that a teaching that a organic acids are useful suspension agents for the broad composition, and that specific organic acid (succinic acid) is useful as a suspension agent in a composition contacting Ir, and that in alternative embodiments other organic acids can be used in the same composition contacting Ir, would mean the organic acid used in the particular example would not be limited to the specific example in which it was used. The Examiner is limiting the invention to the examples provided, in clear contravention of the statement in paragraph [0144] that it is not intended that the scope of the invention be limited to the specific embodiments described.

Claim 139:

The Examiner rejects claim 139 for new matter, stating the specification never literally defines the phrase “about 1:1.” Applicants traverse. Claim 139 recites in pertinent part “wherein the selectivity of the composition for polishing the noble metal-containing material over polishing the dielectric material is about 1:1.” The specification in paragraph [0007] introduces the selectivity of the composition “in terms of removal of metal relative to the removal of surrounding material or dielectric. The specification in paragraph [0008] states “Once a metal feature is substantially coplanar with surrounding material ... preferably, the selectivity ratio of the CMP composition ... is close to 1:1, such that dishing and erosion of the metal feature and the surrounding material is avoided.” Applicants contend the teaching of a selectivity “close to 1:1” in paragraph [0007] is adequate support for the recitation of a recitation of a selectivity of “about 1:1” as recited in claim 39.

Claims 89 and 105:

Claims 89 and 105 stand rejected under 35 USC 112, second paragraph, as the term “carbide” is indefinite. The claims have been amended to make this rejection moot.

Claims 90, 91, and 106

Claims 90, 91, and 106 were objected to. The claims were amended as suggested by the Examiner.

Rejections over Cited Art

Claims 77-106, 108-120, 122 and 125-139 stand rejected as obvious over Brusic (USP 6,527,622) alone or in view of Fang (USP 6,461,227) and Dirksen (published application 2002/0076932). Brusic was filed on January 22, 2002. Attached is a Declaration under 37 CFR 1.131 of inventor Robert J. Small, showing conception and reduction to practice prior to July 24, 2001, which is before the filing of the primary reference in the Examiner’s rejection.

Independent Claim 77

Claim 77 recites in pertinent part

“a combination of ... a substrate comprising submicron integrated circuits and having a surface having at least one feature thereon comprising a noble metal; said substrate surface contacting a chemical mechanical polishing composition comprising: periodic acid and an abrasive in a combined amount sufficient to render the substrate surface substantially planar and to maintain a polishing rate of between 300 Angstroms per minute to about 2000 Angstroms per minute upon chemical-mechanical polishing thereof, wherein periodic acid is in an amount from about 0.05 to about 0.3 moles/kilogram.”

Page 2 second paragraph of the July 24, 2001 document mentions the desirability of polishing noble metals at “desired high polishing rates.” Example A on pages 3-5 of the July 24, 2001 document show a slurry of an abrasive and 0.1 moles/Kg periodic acid used to polish Ir at a rate between 375 and 400 angstroms per minute (*see* the first paragraph, page 5). There is numerous additional supporting examples as described in the Declaration, and Ir polishing rates are 325 angstroms per minute; 360 angstroms per minute, 320 angstroms per minute, 340 angstroms per minute; and 350 angstroms per minute. Example 0 on pages 32-34 of the July 24, 2001 document show a slurry of an abrasive and 0.1 moles/Kg periodic acid used to polish Pt at a rate of 443 angstroms per minute. Submissions of laboratory notes in the Declaration submitted on June 16, 2004 showing slurries containing 2-4% abrasive and either 0.1 or 0.2

moles/kg of periodic acid, and exhibiting Ir rates between 300 and 2000 angstroms per minute, are expressly incorporated by reference in the instantly submitted declaration in part (7). Composition P (208a) on page 34 of the July 24, 2001 document shows a composition having 0.1% periodic acid, which is about 0.005 moles/kg, exhibiting the Pt removal rates between 300 and 2000 angstroms per minute, specifically between 470 and 1020 angstroms per minute when used with normal polishing parameters. Applicants contend this shows reduction to practice of the invention of claim 77 well before the filing date of the primary Brusic reference. Applicants respectfully request this rejection be reconsidered and removed.

Additionally, Brusic does not teach polishing the noble metal with a composition comprising periodic acid at a rate between about 300 and about 2000 angstroms per minute. In Example 1, even at a extremely high (and commercially un-usable) 500 RPM revolution rate, the platinum polishing rate varied between 1 and 60 angstroms per minute with persulfate and between 5 and 377 angstroms per minute with hydrogen peroxide. As is known in the art, hydrogen peroxide is unstable and is subject to substantial degradation over time periods typically encountered in industry for preparing, storing, and using polishing slurries. Periodic acid is more stable than hydrogen peroxide. No example or embodiment was described having periodic acid and attaining the recited polishing rate. For ruthenium, none of the polishing compounds with persulfate reached a polishing rate of 300 angstroms per minute, though many did when ruthenium was polished with hydrogen peroxide. But Brusic did not teach or suggest such a rate was obtainable utilizing periodic acid. With respect to claims 94 to 111 and 139, neither Brusic nor any of the secondary references teach a composition having the required selectivity, nor the desirability of the selectivity as taught in paragraphs [0007] - [0008].

Claim 94

Claim 94 recites in pertinent part

“a combination of ... a substrate having ... a noble metal ... contacting a composition comprising: periodic acid in an amount from about 0.05 to about 0.3 moles/kilogram;; and an abrasive in an amount from about 0.2 to about 6 weight percent, said composition having a pH from above pH 5 to about pH 10; and wherein on polishing the substrate surface with the composition contacting the surface the selectivity of the composition for polishing the noble metal-containing material over polishing the dielectric material is at least 1:1.”

As described in the Declaration, Applicants had possession and reduction to practice of this invention prior to the filing date of the primary Brusic reference. See, e.g., Examples F, G, H, I, and K on pages 14-23 of the July 24, 2001 document. Applicants respectfully request that this rejection be reconsidered and withdrawn.

Claim 112

Claim 112 recites in pertinent part

“a composition consisting essentially of: 1) water; 2) periodic acid in an amount from about 0.05 to about 0.3 moles/kilogram; 3) a first alumina abrasive in an amount from about 0.2 to about 6 weight percent; 4) optionally, a pH-adjusting agent in an amount sufficient to cause the pH of the slurry to be between about 1 to about 4 or between about 5 to about 10; 5) optionally, a suspension agent, wherein said composition is contacting B) a substrate surface having at least one feature thereon comprising a noble metal..

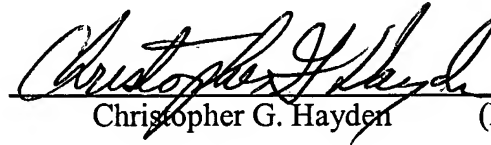
As described in the Declaration, Applicants had possession and reduction to practice of this invention prior to the filing date of the primary Brusic reference. Applicants respectfully request that this rejection be reconsidered and withdrawn.

Additionally, Brusic describes compositions useful for polishing noble metals that requires polishing additives selected from the group consisting of diketones, diketonates, heterocyclic nitrogen-containing compounds, heterocyclic oxygen-containing compounds, heterocyclic phosphorus-containing compounds, urea compounds, nitrogen-containing compounds that can be zwitterionic compounds, salts thereof, and combinations thereof; or a metal compound with two or more oxidation states used in conjunction with a peroxy-type oxidizer, or .alpha.-alumina and fumed alumina, wherein the weight ratio of .alpha.-alumina to fumed alumina is about 0.6:1 to about 9:1. The composition of the present invention, having consisting essentially of language, prohibits an effective amount of any of diketones, diketonates, heterocyclic nitrogen-containing compounds, heterocyclic oxygen-containing compounds, heterocyclic phosphorus-containing compounds, urea compounds, nitrogen-containing compounds that can be zwitterionic compounds, or a metal compound with two or more oxidation states used in conjunction with a peroxy-type oxidizer. These compounds are central to the invention of Brusic (see for example the abstract of Brusic), but are not permitted in the combination of claim 112. For this additional reason, Applicants respectfully request that this rejection be reconsidered and withdrawn.

No fee is believed necessary relating to this response – however, if any additional fees are deemed necessary for any reason, the Office is authorized to charge them to Morgan, Lewis & Bockius LLP Deposit Account No. 50-0310.

Respectfully submitted,

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